Climate Change and Human Health

Author(s): Anne Grambsch

Affiliation(s): Global Change Research Program, National Center for Environmental Assessment, Office of Research and Development

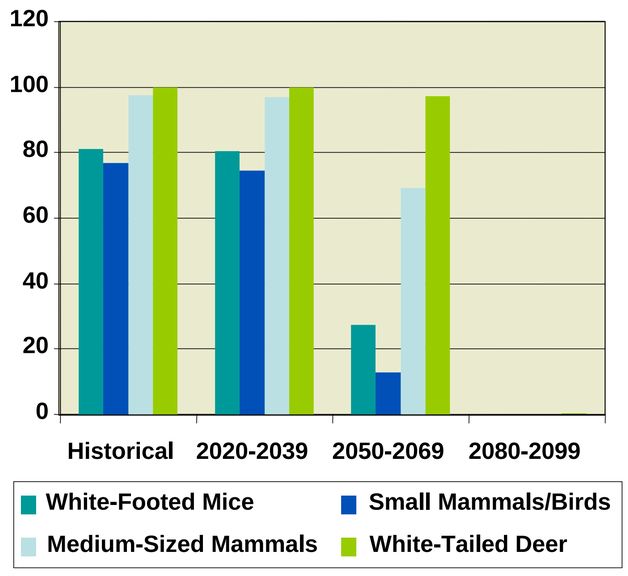
Introduction

Health effects associated with global change may be wide-ranging and occur via pathways of varying directness, scale and complexity. These potential effects have been described in several recent assessments including the IPCC Third Assessment Report, World Health Organization reports and the U.S. National Assessment.

EPA's Global Change Research Program engages in three types of activities with respect to climate change and human health: 1) Needs Assessment, 2) Health Impacts Research, and 3) and Assessment and Adaptation/ Decision Support. The goal is to produce results that are useful to public health officials so that effective and beneficial adaptive actions are taken to protect human health. Three examples from EPA's GCRP are illustrated.

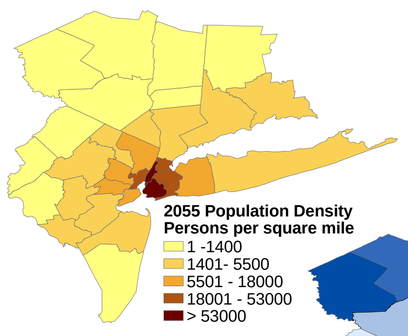
Changes in Lyme Disease Risk: Baltimore

- Seasonal dynamics of *Ixodes scapularis* and prevalence of *Borrelia burgdorferi* are influenced by weather (precipitation, max/min temperature, and saturation deficit), soil type, vegetation, host types, day length, and densities.
- Daily output from HADCM3 GCM was used to assess Lyme disease risk under two GHG scenarios (SRES A2a, B2a).
- A simulation model of Lyme disease, hosts and vectors (LymSiM) was used to integrate these factors.
- For Baltimore: Saturation deficit reduces survival, outweighing faster development rates from warmer temperatures; overall risk decreases.

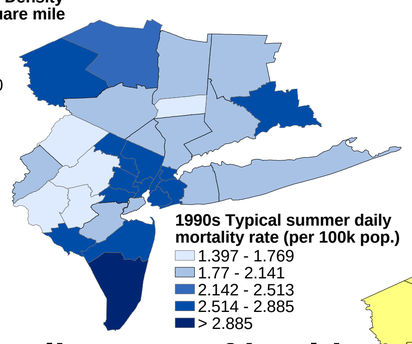


PIs DA Focks, T Kittel, JA Patz. Research supported by EPA GCRP CA# CR827040 and STAR Grant R824995

Impacts of Potential Climate Change on Air Quality and Public Health



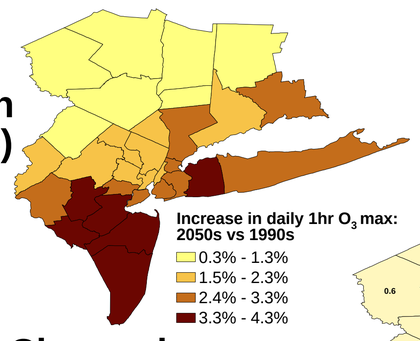
Population



Baseline rate of health outcome (*e.g.*, deaths)

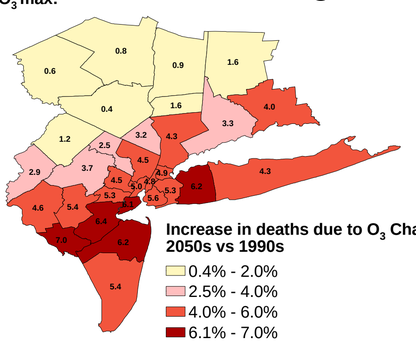
- Baseline data on population and mortality rates gathered
  - Population of 31-county area was 21.5 million in 2000
- Meteorological outputs from linked GISS-MM5 model used to drive regional air quality model (CMAQ)

- Simulated future changes in O_3 concentrations combined with Concentration-Response coefficients to estimate changes in ozone-related mortality



Change in ozone concentrations

- Ozone-related mortality projected to increase 5% due to climate change alone.



Projected increases in ozone-related deaths in 2050s

PI Kinney et al., Columbia University
Research supported by STAR Grant R828733

Global Health Scenarios

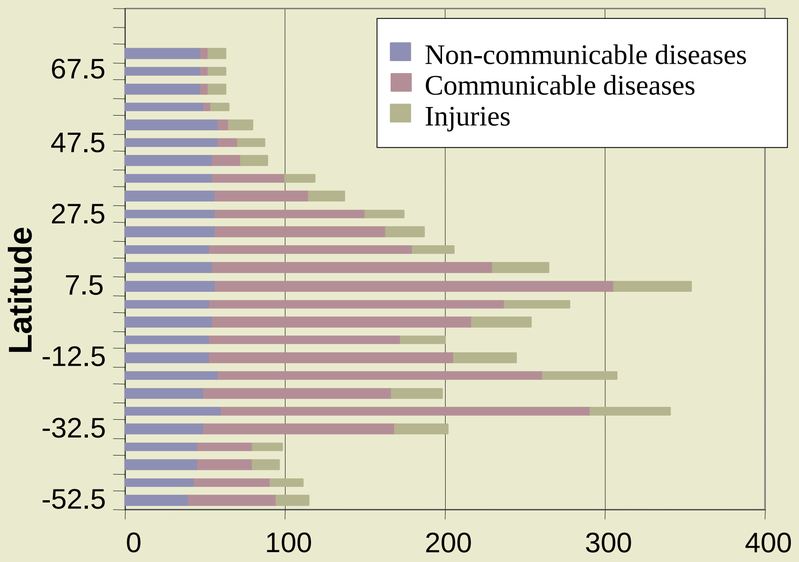
Project Goals:

- Determine if there is a simple global relationship between temperature and health (*e.g.*, Disability Adjusted Life Years)
- Develop a health model which could be used with demographic models to estimate future population

Results:

- Using latitude as a proxy for temperature, the data (and univariate models) suggest a negative relationship.
- A multi-factor analysis reveals that other factors, including social, environmental, and economic conditions, affect population health; simple causal mechanisms were not found.

Years of Life Lost+Years Lived with Disability



	Coefficient	Standard Error	t-Stat
Intercept	25.80077	4.184903	6.165201
Log PCI	5.368022	1.610414	3.333319
Medical Care	0.078104	0.036186	2.158435
Literacy	0.091095	0.030503	2.98638
Water/ Sanitation	0.133713	0.033806	3.955303
Sub-Saharan Africa Indicator	-8.96738	1.214451	-7.3839

$R^2 = 0.899$

PIs: HM Pitcher, KL Ebi, AL Brenkert.
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